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WE HAVE THE PLEASURE of informing our readers that a step long considered desirable has been taken. The price of *Science* has been reduced to \$3.50. This has been rendered possible by the improving position of the paper financially, and by taking a form which saves largely in the items which make up the cost of manufacture. The saving in paper by making the page nearly double the size of the old *Science* page allows a saving of many hundred dollars each year, which would otherwise be spent on white paper for extra margins. We mention this as an item little suspected by most people. Each subscriber will find that his subscription has been extended *pro rata*.

THE ACT TO REGULATE the licensing and registration of physicians and surgeons, and to codify the medical laws of the State of New York, has been signed by the governor, and is now a law. By Section 9 of the act, all pre-existing laws relating to these subjects are repealed; so that to this single act physicians, attorneys, and courts must hereafter look for the regulation of the practice of medicine in this State. It is gratifying to find that this act is indorsed by all the different schools of medicine, and that the only opposition made to it has come from those who believe that the power of healing by the laying-on of hands is likely to be diminished or impaired by the course of study required by the medical colleges. We are glad to see that the objection which we had to make to one of the sections in the act of 1880 is thoroughly and satisfactorily met in the present law. Physicians may hereafter practise in other counties than that in which they first registered, by simply mailing to the county clerk their certificates of registration. Upon this an indorsement will be made which will render practice in the new county legal. Provision is also made by which registered physicians can attend isolated cases in other counties without re-registration, provided they do not intend to habitually practise in such counties. By another section of the act, no person can be licensed or permitted to practise who has been convicted of a felony by any court of competent jurisdiction; and conviction of a felony cancels the license, if one has been granted. We are informed that there is now practising in New York one who has served three terms of imprisonment for criminal practice. The following offences are also punishable under this law: perjury, in false affidavit of registry; counterfeiting, buying, selling, and altering diplomas, or practising under counterfeited diplomas; or falsely personating another practitioner. It is not improbable that this act may in the future require some modification; indeed, it would be strange if it did not; but the medical profession is to be congratulated on having all the laws pertaining to it codified, and thus enabling its members to ascertain their privileges and responsibilities without searching through the session-laws of many years. To Mr. W. A. Purrington, counsel for the medical societies of the State and county of New York, much credit is due for the skill with which this act is drawn, and for his persistence in urging the measure upon the legislative and executive branches of the State government.

THE NINETEENTH ANNUAL co-operative congress of delegates from co-operative societies in Great Britain and Ireland has closed its session at Carlisle. An exhibition was held in connection with the meeting, which included products purchased or imported by the wholesale for distribution to the retail societies. The exhibits indicated the strength of distributive co-operation in the power to purchase on the largest scale from producers or importers. There were also fabrics and manufactured articles which indicated the advance of co-operative production. It is in this sphere of production that the question is raised whether the benefit of co-operation embraces the working producers as well as the consumers, whether spinners, weavers, and dyers, tailors, needlewomen, and shoemakers, are really co-operative producers, or wage-earners having no interest in the sale of that which they produce. The voluminous returns made to the congress throw much light on the present position of co-operative production. There are in England fifty-eight productive societies, and they make cotton-cloth, elastic web, flannel, hosiery, quilts, table-covers, worsted, boots and shoes, galvanized ware, nails, watches, cutlery, locks, baking-powder, portmanteaus, trunks, and biscuits. Scotland has eight such societies. Last year these sixty-six societies sold goods to the amount of £1,817,000, and the net profit was £74,000. Of this profit, £24,871 was paid on share capital, over £1,913 was paid to labor by seventeen societies, and £33,733 to purchasers. Mr. Thomas Hughes delivered an admirable address at the opening of the congress, summing up the past, and pointing out the future problems for co-operation to deal with. He said that the problem of distribution was already fairly solved, and that there is hardly any neighborhood, from John O'Groat to Land's End, to which co-operation has not penetrated. "Our membership," the speaker continued, "is numbered by millions, and the poorest member of the smallest society can now be sure that he gets as full value for every shilling he has to lay out as the richest. Co-operation has taught English working-men how to get full and fair value for the wages of their work: can it help them in like manner to get full and fair value for the work itself? This, Mr. Hughes asserts, is the pressing question, and it must be faced at once. He deprecates the solution of it in accordance with those who favor centralization rather than federation. He pressed this point very earnestly, and apparently with the approbation of a majority of the delegates to the congress. Lord Ripon, speaking in London just before the congress met, also urged the necessity of settling the question of co-operative production without having recourse to centralization.

AT THE RECENT graduation exercises of the St. Louis Manual-Training School, Professor Woodward pointed out the fact that the number of graduates was increasing each year. The first class numbered twenty-nine; the second, twenty-nine; the third, thirty-nine; the fourth, forty-five; and the fifth, fifty-two. Professor Woodward also enlarged upon the way in which the course of instruction at the school is organized. He showed that but one-third of the time is given to shop-work, and that it is distributed in such a way that the students acquire not so much dexterity in a single direction or in a few directions, as a knowledge of principles and methods in many directions. He protested against the assumption that the graduates of the school are skilled workmen in several crafts. They are simply better educated than their fellows who

have had no manual training. The St. Louis school has never received a dollar from either the city or the State, and, as Professor Woodward phrased it, "the director is gratified by the thought, that, in spite of its many shortcomings, the school has served to demonstrate the entire feasibility of incorporating intellectual and manual training in such a way that each is the gainer thereby, and that it has correctly read the public demand for a valuable mental discipline which shall at the same time insure the acquirement of knowledge and skill of intrinsic worth."

THE INCREASE OF STATE INTERFERENCE IN THE UNITED STATES. — I.

THE most casual newspaper-reader and observer of legislation must have had his attention attracted to a growing tendency in our legislation toward the regulation of private and personal concerns. We are aware, of course, that the term 'private and personal concerns' may be said to be more or less indefinite; but it is nevertheless true, that, as used by the majority of intelligent people, its content is, in a general way, understood and agreed to. It is in this generally accepted sense that we use it here.

A few weeks ago we editorially called the attention of the readers of *Science* to an article in which Dr. Albert Shaw of Minneapolis illustrated the tendency of which we speak, from recent legislation in Minnesota. Dr. Shaw gave a digest or summary of the session-laws of 1885 in his State, and pointed out not only the relatively large number of laws that may be put under the head of 'State interference,' but the great variety of subjects with which they attempted to deal.

It is our opinion that the majority of the American people are not aware of this tendency in legislation, and that many of those who are informed about it do not appreciate its real character, nor the result to which it logically leads. To arouse discussion on these points, as well as to secure more accurate data than have yet been laid before the general public, we have addressed letters to various students of legislation and political science in all parts of the country. In our correspondence we have presented four questions, as follows: 1. How far does the legislation in your State show a tendency similar to that observed in Minnesota? 2. In what new particulars is State interference being manifested? 3. Do you believe such interference to be advisable? 4. If not, what measures would you adopt to check it? It is the answers to these questions which we now desire to lay before our readers. As was to be expected, the different correspondents differ widely, both in standpoint and in method. In a few cases correspondents from the same State interpret the tendency of legislation in that State differently. The one considers it in the line of State interference, the other does not so view it. In a small number of cases the writers have considered the questions as affording them an opportunity to make an attack on protection, prohibition, or some similar question. These answers, involving as they do a begging of the question, are of no value for our discussion. But, setting aside a few such instances as these, the replies are of very great interest and value, and are of practical unanimity in stating that State interference is becoming more general in all parts of the country, and along pretty much the same lines. Granger legislation pure and simple, anti-co-operation legislation in general, and labor legislation, are the classes under which the vast majority of the laws indicating State interference may be brought. The question at issue is, we take it, twofold, involving, first, the conception of the powers and duties of the State; and, second, the application and use of these powers and duties. This has not always been comprehended by our correspondents. And, furthermore, for others than professed students of economics, it will require some thinking and investigation in order to take a position on the questions involved which shall be worth any thing. As Pres. Francis A. Walker writes, "For an out-and-out *laissez-faire* it is easy to dash off some highly objurgatory remarks on the subject of State interference; but for one who believes that the State has important functions, social and industrial, as well as political, it would require much time and thought to give a proper expression of one's views as to where State interference should begin, and where it should end."

Although the expressions of opinion which we have received come from all parts of the country, it will conduce to clearness if we discuss them by locality. For that reason we begin with the New England States.

In Maine it seems that the tendency referred to is quite noticeable, though it has only become so recently. Mr. F. E. Manson of the *Kennebec Journal*, Augusta, writes, that, until the Legislature of 1886 passed slight restrictive measures, there were no laws which regulated the formation of private and corporate concerns. Prof. A. E. Rogers of the State College at Orono designates three particular directions in which State interference is being manifested: (a) the increasing stringency of sumptuary laws, (b) the tendency to diffuse education among the masses, and (c) the increasing tendency to protect individual interests against corporate power. Professor Rogers is emphatically in favor of this development of State interference. He writes, "The government exists for the benefit of the people, and whatever, *all things considered*, conduces to their benefit, is in the province of the government. In the proposing and determining of legislation is the test of statesmanship. No fixed rule can be laid down as to what measures may or may not be undertaken." And then, with a bluntness that sounds like Patrick Henry, the professor defiantly adds, "If this smacks of socialism, so does the very organization of man into society, so does government itself."

From Massachusetts we have received a large number of replies; and it is extremely interesting to compare the views they take as to whether legislative interference is extending or not. Mr. Thomas Wentworth Higginson, himself a legislator as recently as 1881, does not believe that the tendency, while observable, has reached a dangerous point. He believes that the town organizations, with their jealousy of all centralization which curtails their powers, will effectually check State interference in Massachusetts. Mr. Higginson instances educational supervision in support of this position, and states that the strong feeling in the towns against State interference has thus far defeated all attempts to secure a more efficient supervision of the schools. Mr. Higginson believes that this local feeling is similar in force and character throughout New England, and attributes the increase of legislative interference in the Western States to the absence of the town organization, with its attendant local feeling.

Prof. John B. Clark of Smith College finds the tendency to have been stronger last year than this, and attributes the re-action to an effort on the part of conservative men to keep the growth of State interference within bounds. Professor Clark instances an arbitration bill (by which either party in a labor-dispute may secure a decision), an employers' liability bill (which makes employers responsible for the acts of their employees resulting in injury to other employees, in cases in which the common law would exempt them on the 'fellow-servant' principle), and a bill fixing uniform times for meal-hours in the case of factory-employees, as examples of the most recent manifestations of State interference. Professor Taussig of Harvard adds to this list certain legislation regarding food-adulteration, but fails to find any distinct tendency toward an increase of legislative interference, save in the case of labor-troubles. Professor Perry of Williams College is of the opinion that Massachusetts is, on the whole, true to "that sound political maxim, 'That government is best which governs least.'" He is inclined to believe that the tendency toward interference is for the most part exhausted in the introduction and push of bills of that general character, and exercises but slight influence on the positive enactments. Professor Perry defines State interference as "nothing but the interference of certain individuals for their own profit with the rights and property of their fellow-citizens in the alleged *name* of the State." We shall refer again to this definition, which seems to us to reach the kernel of the whole matter.

Another correspondent, Mr. Joshua H. Millett of Boston, finds that Massachusetts legislation shows a very great increase in the number and variety of measures that may be styled 'interfering.' On the statute-book he finds laws very similar to those cited from Minnesota. "Laws treat of almost every article of consumption and use," writes Mr. Millett. Among the articles legislated about are butter, cheese, fish, bread, vinegar, hops, leather, ashes, milk, oil, gas, lumber, fertilizers, fruit, hay, marble, nails, and sewing-

thread. The State gives bounties to agricultural societies. The practice is extending of bringing all places of resort and amusement under the control of the State. In 1885 an act was passed, permitting municipalities to control skating-rinks, in order that the attendance might be regulated irrespective of sex and age. A recent law prohibits minors under the age of eighteen from working more than sixty hours a week in mercantile establishments. A weekly-payment law was passed in 1886.

Dr. Davis R. Dewey of the Massachusetts Institute of Technology finds that "the tendency of the statutes toward State interference is not so marked in Massachusetts as in Minnesota." From 1866 on, each year has seen an extension of legislation in the direction of control over employers.

Dr. E. W. Bemis of Springfield writes that "there has been a steady increase of State action during the past ten years in Massachusetts. This increase has been chiefly in matters of monopoly regulation, sanitation, education, and labor legislation. There has been no marked interference with the ordinary business or domestic life of the people, but the State has been called upon to control for the public good, large and otherwise irresponsible corporate bodies, and to protect the weak and ignorant." Dr. Bemis relates a case in which the New Haven and Northampton Railroad objected to the advice of the railroad commission to establish a depot in the town of Whately, Mass., through which the road ran. The commission thereupon ordered the depot built, and said, "The mistake of the railroad-managers in such cases is in supposing that the interests of the stockholders are paramount, and that the earning of dividends is the sole object to be sought in operating a road. Our supreme court has said more than once that a railroad-corporation is erected mainly for the public benefit, and only incidentally for its own profit. And because directors are liable to take a wrong view of their duties, the State reserves full control, and delegates to its agents the power of supervising the operation of these corporations." The State has a savings-bank commission with similar powers and duties. In 1885 a gas commission was organized, the function of which is, upon the complaint of the mayor of a city or the selectmen of a town in which a gas company is located, or of twenty customers of such a company, relative to the quality or price of the gas, to give a public hearing, and order such reduction in price or improvement in quality as seems best. And in Worcester this provision has been applied, and a reduction in price from two dollars and a quarter to a dollar and a half a thousand cubic feet was ordered by the commission. Thus, at one blow, the gas company's income was reduced by more than fifty-six thousand dollars per year. Dr. Bemis further states that more than four-fifths of the area, and probably two-thirds of the population, of the State, are under local prohibition.

Dr. Bemis sees no occasion for alarm in the progress of this tendency, because it has only passed into practice in "such cases as the condition of the times seems to demand."

[To be continued.]

THE EXPLORATION OF ARCTIC AMERICA.

THE map accompanying the present number of *Science* shows the present state of our knowledge of north-eastern Arctic America. During the last ten years very little has been added to our knowledge of this vast territory as compared to the period from 1845 to 1870. It was during that time that the search for Franklin resulted in the thorough exploration of the Arctic American Archipelago, in the discovery of the waters north of Smith Sound, and the discovery of the unknown parts of the coast of the continent. Though English expeditions did the greatest part of this work, we Americans may boast of names and discoveries not inferior to theirs: de Haven, Kane, Hayes, Hall, are names that will always be remembered in the history of arctic exploration. The names of American patrons of science, such as Grinnell's, are justly given to lands and seas discovered by the expeditions they had sent out.

After the period of lively activity in the Arctic regions, a relapse ensued, and the noteworthy expeditions since 1870 are very few. The German expedition to East Greenland explored part of north-eastern Greenland, and discovered the large fiords of that coast. It is only since last year that the important results of

Holm's expedition in 1884-85, on the east coast of Greenland, are known. He discovered the ragged coast of Christian IX. Land. Danish explorers are continually adding to our knowledge of West Greenland. Nordenskiöld's remarkable journey into the interior of Greenland was made in 1883. However, it is in the Smith Sound region that the most important additions to our knowledge have been made. Every new expedition pushed the limit of the unknown area farther north. Bessels' tide-observations made on the 'Polaris' expedition first established the insularity of Greenland by showing that the Atlantic tide enters Robeson Channel from the north. The important explorations of the expeditions of Nares and Greely need hardly be mentioned. The explorations in the other parts of Arctic America are of no great importance. Hall's observations from 1864 to 1869, which were published only lately, gave corrections for several parts of the American coast; Schwatka's bold march to King William Land added a few details to that part of the map. A few scattered surveys by whalers, principally those of the enterprising Captain Spicer of New London in Fox Basin and Hudson Strait, are embodied in our map. Last we have to mention the German surveys on the east coast of Baffin Land.

How little is this as compared to the results of former years! And how much is still to be done! On looking at our map, it might seem as though the coasts and part of the interior were well known, but all maps are deceptive in this respect. In many instances we do not know the sources from which the information contained in the map was derived, and consequently are unable to test their accuracy; but wherever this was done, the maps proved to be utterly unreliable. A few weeks ago we mentioned the journey of Missionary Peck from Richmond Gulf on the west coast of Labrador, to Ungava Bay, by way of Seal Lake and Freshwater Lake. He reported that no such rivers and lakes exist as shown on our maps; yet we have to do the best we can, and reproduce what former maps contain, as it comes nearest to the real configuration of the land. Colonel Gilder informs us that the coast near Chesterfield Inlet is not at all similar to the map, but we have no means of correcting it. Is it necessary to point out a few other inaccuracies of the map? We do not know the configuration of Ungava Bay and the north-western half of Labrador; Wager River, on the west coast of Hudson Bay, and the north coast of Hudson Strait, are practically unknown; Eclipse Sound, on the west coast of Baffin Bay, is drawn from a rough sketch, without any actual survey, and so is Admiralty Inlet; and the vast territories in the interior of the islands and continent have not yet been visited by any scientific man. In short, there is not a square inch on this map on which important discoveries might not be made.

However, those are 'polar regions;' and it seems that, after the sad experiences of de Long's and Greely's expeditions, the mere word 'polar' is sufficient to suppress all interest in such explorations. The ideas conveyed by the word are of ships crushed by ice, and a party starving on an ice-field or devoured by ferocious polar bears. But this is a gross misconception of what polar exploration is and ought to be. Its object is the thorough exploration of the Arctic region and of all its phenomena. In order to attain this object, it is not necessary to organize adventurous expeditions the sole object of which is to push north and gain a few miles upon predecessors. The exploration of the polar regions is not a work for the bold and daring adventurer: it is the task of the careful scientist, who knows thoroughly what science will profit by every mile gained and by the study of all the phenomena of regions often passed by ships or never visited by man.

We will draw attention to some geographical problems which offer themselves in the vast area shown in our map, and which can be solved without incurring great expense or great danger. The problem which is of greatest importance is the exploration of the islands west of Smith Sound. There are two starting-points for such expeditions,—Hayes Sound and Jones Sound. Eskimo reports lead us to suppose that Hayes Sound forms a strait leading to the western ocean; but, even if this be not the case, Greely's expedition across the isthmus between Archer Fiord and Greely Fiord shows that it would not be difficult to reach the west coast. Jones Sound is easier of access. It has only been visited twice,—by Belcher and Ingfield on a short trip,—and no serious attempt has been made to explore its western continuation. From Eskimo

reports it would seem that it is closed, as indicated on our map; and seal and walrus are said to abound in its western part, which is formed by low land. If this information is correct, this would be an excellent starting-point for the exploration of the archipelago west of Ellesmere Land and the west coast of this large island. Such an expedition would not be very expensive, and almost without danger. The American expeditions of Schwatka and Hall show that sledging in the Arctic is the most successful and least dangerous way of making explorations. This district is of the greatest importance from a geographical point of view, forming the northern limit of the American continent. It will be very interesting to know the configuration of this district and its extent towards the north-west. The study of this region will show how far the heavy ice met with at the outskirts of the Arctic islands extends south-eastward.

Another exploration which might be easily accomplished is that of Fox Basin and Hudson Strait. A ship stationed in these waters for two years might solve all important questions of that country. Ethnologists wish for an exploration of the central parts of the Arctic coast, particularly between King William Land and the Mackenzie, where the Eskimos may be studied uninfluenced by Europeans. These are tasks for American travellers. But where is the patron to-day who would encourage and support such enterprises? Who will be the next to carry north the little Henry Grinnell flag, which waved in so many parts of Arctic America? The means which are required to carry on such researches are so small that they will not hinder the resuming of the work as soon as it may be considered desirable.

Such work is not the adventurous 'polar expedition,' the only aim of which is to push north; but these explorations will enable us to go on step by step, and to reach the unknown regions of the Arctic Basin without running great risks. Explorations in Jones Sound will show how far we can go. East Greenland offers a safe basis for expeditions towards the north, and so does Franz Joseph Land. Hazardous expeditions into the open ocean without the shelter of land and without any line of retreat, such as de Long's expedition, must be abandoned, as they will almost always end in disaster. The exploration of the pole is not a work for a single adventurous expedition, however lucky and successful it may be, for the risk such travellers run is not adequate to the probable results. Progress must be made cautiously, and founded on the discoveries and experiences of past expeditions: therefore we believe that spasmodical efforts now in East Greenland, now in Smith Sound, now in Franz Joseph Land, are not desirable, but that one plan ought to be pursued by Arctic explorers. It is only thus that scientific results can be obtained.

The problems which must be solved in the Arctic regions are numerous and important. It is more than curiosity if we desire to know the outlines and the interior of the Arctic and Antarctic islands and continents; for without this knowledge geographical science is imperfect. We must know it, if we want to understand the circulation of the oceans and of the air; and researches in the Arctic are indispensable for the study of terrestrial magnetism. It is sufficient to mention these facts. Even commerce will profit by such expeditions. The produce of whale-fishery adds yearly considerably to our national wealth, and by new expeditions new hunting-grounds have always been opened. Many other resources of the Arctic Ocean are not yet made use of. There are enormous herds of walrus in regions easy of access, there are the lakes and rivers abounding in salmon, there is the valuable fur of the black fox and polar bear, and, though the commercial interest will always be of secondary importance in such enterprises, we must not overlook it.

Our map teaches that the problems of arctic exploration must not be looked for in the extreme north alone. The coasts of Arctic America and its numerous islands are a field for travellers which will yield important results for years to come. The explorer of these regions will contribute not less to science than the adventurous traveller who seeks to reach the pole, and his work will be surer of success, and accomplished with less danger and at smaller expense. We hope that researches in these regions will soon be taken up again, and that we may soon see American explorers again at work in this field.

DISTILLERY-MILK REPORT.¹—IV.

Bibliography.

IN the replies received from our correspondents in answer to the circular letter, references are made to the following authorities, from which we make liberal quotations:—

Manual of Cattle-Feeding. By HENRY P. ARMSBY, Ph.D. New York, Wiley, 1887.

In the manufacture of distilled liquors, the first stages of the process are essentially the same as in the preparation of malt liquors, but after the fermentation the mash is subjected to distillation to separate the alcohol. The residue remaining in the still constitutes distillers' grains, or 'slump.' This has much the same composition as brewers' grains, except that it is more watery, containing only about eight or nine per cent of dry matter. Like brewers' grains, it has lost chiefly non-nitrogenous matters: it consequently has a narrow nutritive ratio, and is a valuable addition to fodder poor in proteine. Moreover, it contains a considerable proportion of mineral matters, which may be of advantage under some circumstances. Distillers' grains are best adapted for cattle, and yield excellent results in fattening or feeding for milk when rightly used. For sheep, hogs, and horses, they are not well suited. In using this feeding-stuff, its watery nature should not be forgotten. Its relatively large proportion of proteine renders it a suitable addition to a fodder deficient in this nutrient; while, on the other hand, the health of the animals requires the addition to the 'slump' of some dry, coarse fodder, like hay or straw. A poor quality of coarse fodder may be rendered more palatable to cattle by saturating it with distillers' grains, and thus the wateriness of the one fodder, and the poverty of the other as regards proteine, can be simultaneously corrected. Used in this way, distillers' grains constitute a perfectly healthy fodder. Much of the common prejudice against the use of distillery slops appears to be occasioned by their irrational application, and frequently by the filthy surroundings of the animals, rather than by any thing injurious in the feeding-stuff itself.

'Milk: its Adulterations, Analysis, etc.' By JOHN MORRIS, M.D. (*Maryland Medical Journal*, June 15, 1882.)

Of all the nutrients employed to rear children deprived of natural food (the mother's breast), I know no one more pernicious than the swill-milk sold in all large cities. Children fed with it appear to thrive and fatten, but their real vitality is much less than that found in those properly nourished. What seems to be fat is merely adipose tissue, just as is seen in chronic ale and beer drinkers, who are also deficient in vitality, and unable to withstand attacks of disease, endure privation or great suffering. During the summer months, cholera-infantum plays sad havoc among swill-fed children. Frequently after a few hours' illness they fall into a state of extreme prostration, collapse and death following rapidly. From the want of tissue-making food, they lack the vital force already alluded to, and all the efforts of the physician to arrest the disease and restore their impaired strength prove unavailing. The infant mortality in our large cities may be attributed in a great measure, I am convinced, to the employment of milk from cows improperly fed.

The draymen connected with the breweries of London are the most unhealthy body of men to be found anywhere. These men have the unlimited privilege of the brewery cellar. Though apparently models of health and strength, the slightest accident that befalls them generally proves fatal. Sir Astley Cooper mentions a case of a drayman, a powerful, flesh-colored, healthy-looking man, who received a slight injury from the splinter of a stave. The wound was trifling, but it suppurated. Sir Astley opened the abscess, but in going away forgot his lancet. On returning to get it, he found the man dying. Beer-drinkers, when attacked by any acute disease, are unable to bear the proper treatment necessary, and consequently die. They cannot undergo the slightest surgical operation with safety. Dr. Buchan says, "Malt liquors render the blood sily and unfit for the circulation: hence proceeds obstruction and inflammation of the lungs. There are few great beer-drinkers who are not phthisical, brought on by the glutinous and indigestible nature of ale and porter."

¹ Continued from Vol. IX., p. 604.

So it is with cattle fed with slops from distilleries: though, like Sir Astley Cooper's drayman, they look powerful and flesh-colored and healthy, and increase in size and weight, they are not truly healthy, and the increase in weight is not due to additional muscle or genuine fat. What appears to be fat is a soft, flabby degeneration of tissue, and, if they are exposed to hardship or attacked by disease, will at once succumb.

In conversation with Mr. Outerbridge Horsey of Frederick County, a well-known farmer and distiller, I gleaned some practical hints in regard to the use of swill in feeding cows. Mr. H. does not believe that it is injurious if given in proper quantities and in combination with grasses or other food. He has abandoned feeding his own cows with it, however, for the reason that it imparts a peculiar odor to the milk, and notably to the butter. This is no doubt the case, for there is a particular pungency in this character of food. Therefore milk from cows fed on swill cannot be made into condensed milk, for such milk when condensed has a rank smell and a bitter taste. The swill, if given in large quantities and for a length of time, exercises a very pernicious influence on some of the organs of the body. The teeth fall out, and it is said that the tails atrophy and loosen. If this be the case, I cannot explain the exact cause. It is a necrosis, and must be due to some poisonous element in the food. Nearly fifty per cent of the inorganic elements in swill is composed of phosphoric acid; but, as the inorganic elements are scarcely five per cent of the whole, I can hardly ascribe the degeneration which takes place to the excess of phosphoric acid. According to Fownes, the inorganic elements of milk are 4.91 parts in the 1,000, as follows:—

- 2.31 Phos. calcium.
- .42 Phos. magnesium.
- .07 Phos. iron.
- 1.44 Chlor. potassium.
- .24 Chlor. sodium.
- .42 Sodium and caseine.

4.91

This gives a little more than one part in a thousand of phosphoric acid,—in normal milk a very small quantity indeed. It may be possible that the necrosis is due to the heat of the swill, for the teeth of pigs become decayed from this cause. Cows do not like the hot food at first, but after a time become exceedingly fond of it,—so fond that they do not care to partake of cold food. Mr. Peter G. Sauerwein relates to me a very singular circumstance in regard to this point. Whilst acting as revenue collector, the machinery of one of the distilleries in his district which supplied slop to the milkmen became deranged for several weeks. During this time the milkmen came daily to the distillery and filled their hogsheads with the boiling water, paying the same price for it that they usually paid for the same quantity of swill. They gave as a reason for this that their cattle were so used to hot food that they cared for nothing else.

Swill, if used judiciously, that is, in combination with good grasses or cereals, is not injurious or objectionable. It serves the purpose of the glass of ale or porter to the nursing mother; that is, it increases the quantity of milk, but I do not believe it improves the quality. There is another form of food given to cattle still more deleterious than swill; viz., the *débris* or refuse left after the extraction of glucose from corn. This is highly injurious, if not poisonous. Fortunately there is not much of this to be procured in Baltimore, as we have but one glucose-factory in our midst; but it is given very freely to cattle in Buffalo and Chicago, where immense quantities of glucose are manufactured.

Inasmuch as the analyses of swill made by different chemists show it to be rich in certain forms of food-elements, it may be asked, why is it so injurious to cows? This is a question more easily asked than answered. The alcohol and fusel-oil which ordinary swill contains are not sufficient to produce the bad results which it is asserted follow its liberal use. Can it be that the excess of nitrogenous and albuminoid substances in this form of food lead to non-assimilation, or other functional disturbances, thus proving its unfitness for the animal economy? Experience is certainly more important than mere chemistry, and therefore the judgment of those feeding cows as well as those consuming the milk must determine

the whole question. Popular prejudice, which in many cases is founded on ignorance, or mere science independent of experience, should not be allowed to determine a matter of this character. Whilst I myself do not think swill proper food for cows, except, as I have before stated, in small quantities and in judicious combination with grasses, and whilst I think that swill-milk is equally unfit for children, I am willing to give those entertaining different views a candid hearing.

Analyses have been recently made, at the instance of those largely interested in this matter, of the swill fed to cows, and also of the milk resulting from its use. These analyses are by two well-known chemists,—Professor Simon of this city, and Mr. Peter Collier of the Department of Agriculture, Washington. Professor Simon furnishes the results of the analyses of three samples of milk,—the first drawn by himself at the stables of Messrs. M. Crichton & Co., from different cows, on April 7, 1882; No. 2 sample bought from Pikesville Dairy Company; No. 3 sample bought from a store in the south-eastern section of Baltimore.

Specific Gravity. 100 Parts Milk contain	No. 1. 1.029	No. 2. 1.031	No. 3. 1.026
Water.....	86.47	87.12	89.93
Fat.....	3.77	3.40	1.45
Caseine.....	4.44	4.23	3.83
Milk-sugar.....	4.56	4.51	4.16
Ash.....	0.76	0.74	0.63
	100.00	100.00	100.00

Mr. Simon says, "In looking over the results of my analyses, you will see at once that the sample drawn by myself from your 'swill-fed' cows compares most favorably with sample No. 2, produced by cows receiving no distillery refuse. Both these samples represent very good milk; and especially No. 1 is, in the amount of cream and total solids, far above the average milk.

"No. 3 sample represents an adulterated article, from which no doubt not only cream had been removed, but to which also some water had been added. I selected this sample out of about two dozen samples, brought from different dealers, as the worst milk which has come under my notice."

Professor Simon furnishes the result of an analysis of swill drawn by himself from about 1,000 gallons at the Melrose distillery on March 6, 1882.

One hundred parts of sample contain of—

A. Volatile products (expelled at 212° F.)	94.63
B. Organic matter.....	4.83
C. Inorganic matter (ashes).....	0.54
	100.00

ANALYSIS OF PORTION A.

Volatile Products.

Water.....	99.74
Alcohol.....	0.08
Fusel-oil (chiefly amylic alcohol).....	0.12
Loss.....	0.06
	100.00

ANALYSIS OF PORTION B.

Organic Matter.

Starch isomers.....	26.68
Cellulose.....	23.83
Albuminoids.....	25.30
Gum.....	6.73
Sugar.....	5.44
Fats.....	7.37
Glycerine.....	1.20
Organic acids.....	1.46
Extractive and coloring matter.....	1.14
Loss and not determined.....	0.35
	100.00

51.98 flesh-producing food.

20.68 fat-producing food.

ANALYSIS OF PORTION C.

Inorganic Matter.

Phosphoric acid.....	48.63
Sulphuric acid.....	1.80
Silicic acid.....	2.22
Chlorine.....	0.20
Carbonic acid.....	5.06
Potash.....	20.14
Soda.....	8.47
Lime.....	6.12
Magnesia.....	7.10
Oxide of iron.....	Traces
Loss.....	.26
	100.00

Mr. Simon says, in his note appended to the analysis, that "swill is a highly nutritious form of food, and that he sees nothing in its composition that could possibly work injury to cattle feeding on it."

The results obtained by Mr. Collier are very similar to those furnished by Professor Simon, but are even a little stronger in statement. He compares swill with corn and rye and other products, and shows that it is richer in food-elements, and decidedly richer than ensilage, which is so highly prized by certain cattle-feeders. In reply to interrogatories, Mr. Collier expresses the belief that swill is a wholesome and highly nutritious form of food, and can be given to cows with great advantage. He, however, adds that much will depend upon the amount given, the circumstances and surroundings, and the proper combination with other aliments.

The truth is, the whole matter in discussion hinges upon this last point, and Mr. Collier has not made it any clearer by his statements, however honestly made. It is to the physiologist, in my judgment, and not to the analytical chemist, that we must look for a scientific solution of the problem. Analytical chemistry serves but a feeble purpose in solving many important questions. By it butter and oleomargarine appear equally wholesome and nutritious; and it can detect but little difference in impurity between water-closet matter, and sewage from which excrement is excluded.

'Milk for Babes.' By E. M. NELSON, M.D. (*St. Louis Courier of Medicine*, May, 1883.)

In regard to the feeding of the cows, there is almost as much variation between different dairies as there is in regard to cleanliness. Nearly all the city dairies make use of the products of the breweries and distilleries as a considerable part of the feed of their cows. So far as the malted grain is concerned, perhaps nothing can be said in objection to its use as a part of the food. It is recommended by the best writers as a valuable and economical constituent of the food of milch-cows. The same cannot be said of the hot distillery swill. The effect of this food has been found by the best and most careful observers to be prejudicial to the health of cows, and to produce a milk that is lacking in nutritive quality as well as being specially liable to speedy change and fermentation. Mr. Lake, who was for many years the largest feeder of distillery swill in the city, asserted that cows fed on this article invariably become diseased within a period of six months, and the lungs show constantly the evidences of tubercular infiltration. Mr. Cabanne states, that, when he formerly fed swill in his own dairy, he butchered over one hundred and fifty cows, and never found one in which there was not tuberculous disease of the lungs.

'Our Milk-Supply.' By W. K. NEWTON, M.D. (*Fourth Annual Report of New Jersey State Board of Health*.)

Swill-milk is rarely heard of now, but not many years ago it was a fruitful cause of disease and death in children. Fearing that the lessons of the past may be forgotten, we are constrained to mention it as a possible cause of disease. Distillery swill, "if properly fed in limited quantities, in combination with other and more bulky food, may be a valuable article for the dairyman; but if given, as it too often is, without the addition of other kinds of food, it soon affects the health and constitution of the animals fed on it. Where this forms the principal food of milch-cows, the milk is of a poor quality: it contains often less than one per cent of butter, and seldom over one and three-tenths or one and one-half per cent. It is

effect on the system of young children is therefore very destructive, causing diseases of various kinds, and, if long continued, certain death. The adulteration of pure milk from the healthy cow by water, though dishonest and objectionable in the highest degree, is far less iniquitous in its consequences than the nefarious traffic in swill-milk, or milk produced from cows fed entirely on still-slops, from which they so become diseased, after which the milk contains a subtle poison, which is as difficult of detection, by any known process of chemistry, as the miasma of an atmosphere tainted with yellow-fever or cholera. The fact is sufficiently palpable, that no pure and healthy milk can be produced by an unhealthy and diseased animal, and that no animal can long remain healthy that is fed on an unnatural food, and treated in the manner too common around the distilleries of many large cities." (C. L. Flint, pp. 144, 208, 216.)

Where swill-milk was sold in New York a few years ago, "it was found different in alimentary character from that produced by cows that were fed on grass, hay, or grain. It was not so well digested in the stomach, nor had it the nutritive power to create flesh and sustain strength. The children lost flesh, and failed to gain it. Their skins were pallid, sometimes discolored and corrugated. Their countenances had the appearance of old age, rather than the bright and lively bloom of childhood. They suffered from diarrhoea and dysentery and great debility, and many died." (Jarvis.)

Fortunately, no swill-milk is sold in this State at the present time, but it is well for health officers to be on the lookout for it. The sale of it is, in this State, considered a misdemeanor, punishable by a fine of fifty dollars and imprisonment for thirty days. The laws of Massachusetts, New York, Michigan, and other States also forbid its sale.

'Report of Committee on City Milk.' By S. R. PERCY, M.D. (*Transactions New York Academy of Medicine*, Vol. II. Part IV., 1859.)

This report, which occupies fifty-three pages of the transactions, is the fullest statement of facts in connection with distillery swill and milk which we have seen. In June, 1858, the New York board of health adopted a resolution that the Academy of Medicine be requested to lay before the board such facts and evidence as they may have in relation to the milk furnished to the citizens of New York. The academy appointed a committee of five of its members, including Drs. B. Fordyce Barker and S. Ratton Percy, and in March of the following year presented its report. The greater part of the labors of the committee was performed by Dr. Percy, and his report is the most valuable. It includes chemical analyses, which we have already given under that head, microscopic examinations and drawings, and cases of disease resulting from the use of distillery milk. Associated with Dr. Percy in his investigations was Mr. Solon Robinson, who had been long conversant with the raising and fattening of cattle, and Mr. Thomas Devoe, who had been long and extensively engaged in the slaughtering of cattle, and in supplying the markets with wholesome beef. Mr. Robinson accompanied the committee to the distillery stables, and, as the result of his observations, said, "From my personal experience in feeding cows with various agricultural products, and in producing milk and butter, I am well satisfied that cows fed as described, and kept in such an atmosphere as I could not remain in ten minutes without feeling severe sickness, must produce poisoned milk. And I do not consider the beef any more fit for human food than the milk; not so much on account of the bad food, as the poisonous atmosphere in which the poor brutes are confined. I would no sooner touch this swill-milk than I would use milk from the most 'milk-sick' region of Illinois." Mr. Devoe, in speaking of the quality of beef furnished by animals fed on distillery swill, says, "I have slaughtered, and seen slaughtered, the various kinds of animals that have been fed, wholly or partially, on this swill, which appears to have produced almost as many varieties of beef, and I think I may be better understood by placing them under three general heads; viz., first-class, second-class, and third-class. The first-class beef, no doubt, is produced from thrifty steers, fed in some of the distilleries in the northern counties of New York, where only a small portion, or the liquid portion, of the food, is swill; the rest being of meal, roots, hay, and grass: and, when brought to our markets in a fat,

healthy condition, their flesh proves to be tender, juicy beef, but not so firm or so sweet and well flavored as if wholly fed on grain, or even grass. The second-class beef is from animals wholly confined in these large distilleries, fed the greater portion on swill, with plenty of hay, and occasionally a little grain. I might add, that the Northern distillery swill is of a superior quality to that which is run into troughs at the various distilleries where it is sold by the hogshead or other particular quantities. These Northern distilleries own both the swill and the cattle, and the quantity of swill made by them is fed up clean. This second class of animals, although they may be fat, produce a softer quality of beef, not so well flavored, but juicy and tender. When they are slaughtered, the flesh will show or produce the peculiar smell attached to this beef. The third class is to be found in some of your neighboring distilleries, where the visitor could almost swear (unless he could see the hay given to the animals) that they had little else to eat than the thin, poor, and sometimes spoiled swill. The beef from the general run of the third class has a very peculiar, unpleasant smell, especially when slaughtered. I have known it so disagreeable as to create nausea, especially on opening the animal to take away the paunch or belly: this and some other parts I have sometimes opened to discover some signs of hay, and in some instances found none. This class of beef retains that smell, especially when cutting it up fresh into pieces, and also when cooking it. It is usually flabby or soft, and often appears adhesive or sticky, like very young veal that had not yet lost nature's first flesh. My conclusions and convictions were made up long before this subject was so strongly agitated, both as to the meat and milk of the distillery-fed cow, which I have considered under the third class; and these conclusions are that neither the milk nor the flesh of these animals can furnish healthy human food." The committee, in summarizing its labors, says that the beef produced from the animals fed in the distillery stables is unsavory, and easily recognized by its offensive odor; that the odor is not dissipated even by the process of cooking; and that the fibre is flaccid, and its cellular tissue is infiltrated with watery fluids instead of solid fat. The milk of these cows does not exhibit the characteristics of wholesome milk: it presents almost invariably an acid re-action. The cases collected by Dr. Percy demonstrate the fact, independent of any chemical examination or any *a priori* reasoning, that the milk procured from these swill-fed animals is injurious to those who use it. In view of the disclosures made, the committee states that it is evident that the traffic in the milk of swill-fed cows is one which is detrimental to the health of the community, and should be discontinued.

'Sanitary Control of the Food-Supply.' By W. K. NEWTON, M.D., health officer of Paterson, N.J. (*Third Annual Report of the State Board of Health of New Hampshire.*)

Distillery waste, and sometimes beer-grains, produce a quality of milk of low nutritive powers, and dangerous to infants.

References are also made to the following authorities: 'Milk-Cows and Dairy-Farming,' by C. L. Flint (Boston, 1874 and 1887); 'Infant Mortality,' by E. Jarvis (*Fourth Annual Report of State Board of Health of Massachusetts*); and 'Milk,' by C. F. Chandler (*Johnson's Cyclopædia*).

[To be continued.]

BOOK - REVIEWS.

Preliminary Report of the Commission appointed by the University of Pennsylvania to investigate Modern Spiritualism in accordance with the Request of the late Henry Seybert. Philadelphia, Lippincott. 12°.

THAT peculiar medley of alleged fact and fanciful theory, of Occidental pseudo-science and Oriental mysticism, which goes by the name of 'Modern Spiritualism,' has been examined more or less frequently, publicly and ably. The advocates of the tenets which this belief imposes have given little attention to the adverse opinions, explaining them away by a piece of logic which would be admirable did it not need such frequent modification, and were it not so evidently manufactured for the purpose, and have vaunted and gloried over all their successful efforts, large and small, in securing proselytes. The commission, whose long-expected report

is now before the public, is most favorably constituted for receiving a hearing destined to be called authoritative, and for registering an important turning-point in the rather sad history of the modern movement. The commission takes its name and its resources from the fund intrusted to the University of Pennsylvania by the will of Henry Seybert, a strong believer in Spiritualism and its physical manifestations. The *personnelle* of the commission leaves nothing to be desired. Its members originally appointed were Dr. William Pepper, provost of the University of Pennsylvania, Profs. Joseph Leidy, George A. Koenig, Robert Ellis Thompson, and George S. Fullerton, all of the same university, and the eminent Shakspearian Dr. Horace Howard Furness. To these were afterward added Mr. Coleman Sellers, Drs. J. W. White, C. B. Knerr, and S. Weir Mitchell. The members individually expressed entire freedom from all prejudices against the subject, and readiness to accept any conclusion warranted by facts; Dr. Furness, moreover, confessed to a leaning in favor of the doctrine.

The method of work of the commission was to take a definite subject for investigation, invite both professional and non-professional mediums (had they been able to procure them) claiming the power of presenting the desired manifestations, and to meet them under fair conditions. The mediums were often exorbitant in their charges (asking a hundred dollars from the commission for what they would do for five for a private citizen), and arbitrary in their conditions. Nevertheless the commission has seen enough to tell a very important and a very interesting story.

They first looked about for a 'professional independent slate-writing medium.' This medium was to take a double slate firmly fastened together, with a bit of slate-pencil placed between, and produce writing on the previously blank slate, professedly the work of spirits in answer to questions addressed to them. Their first medium (a Mrs. Patterson) kept them waiting one hour and a half, and on another occasion one hour and twenty minutes; but the slates remained as clean as at first. Their next medium was the famous Dr. Henry Slade, with whom they had several sessions, all with the object of obtaining the slate-writing under conditions varying in detail, but not in principle, from that above described. Dr. Slade has two methods: for the long, clearly written messages, he substitutes at a favorable moment a prepared slate for the one given him; for the short, hardly legible messages, he in one way or another writes on the slate while hidden from view of the two or three observers (he allows no more) seated with him. Every particular of the process has at one time or another been seen by the committee. In fact, on the day when Dr. Slade received three hundred dollars in payment for his services, he was so excited that he could hardly sign the receipt; and the cause of this excitement was simply that shortly before, Dr. Furness had kicked over a slate placed at the foot of the table, and thus exposed the prepared writing upon it. In short, their verdict with regard to the doings of this their most famous medium is, "that the character of those which passed under our observation was fraudulent throughout. There was really no need of any elaborate method of investigation: close observation was all that was required."

Next with regard to rappings. Their preliminary conclusion reads that "the theory of the purely physiological origin of the sounds has been sustained by the fact that the mediums were invariably and confessedly cognizant of the rappings whenever they occurred, and could at once detect any spurious rappings, however exact and indistinguishable to all other ears might be the imitation."

The commission attempted to procure some 'spirit photographs,' but were asked three hundred dollars for this luxury, and were to be excluded from the room at the critical moment. They very properly refused any such terms.

The brother of the would-be photographer (Keeler is the family name) is also a medium. His specialty is to 'materialize' a right hand when apparently holding his neighbor's wrist with both his hands, and have this hand perform the usual simple tricks with the musical instruments, etc. The trick was afterwards repeated by one of the commission, and consists in really holding the wrist with one hand only, but producing the feeling in the owner of the wrist of its being clasped by both. The right hand is then free to do all the hocus-pocus.

Another medium did about the same thing with his hands apparently tied. That his hands were loose enough for all that was done, was glaringly evident.

Thus far the commission as a whole. Their verdict is everywhere the same: "No new facts and many old frauds." Individually the members have seen much, in fact, more than the mediums intended. The experiences of Dr. Furness, the acting chairman, are especially interesting, and recorded with a humor that does much to relieve the monotony of this record of constant fraud and deceit. Dr. Furness was repeatedly assured by several Spiritualists that there was in him the making of a magnificent medium; and so he sacrificed himself for the cause, and 'sat for development.' Every day for six months Dr. Furness sat with a slate for half or three-quarters of an hour, and, in addition, constantly wore a bit of magnetized (!) blotting-paper on the top of his head, until he was allowed, by the dispensation of the medium under whose direction he was studying, to wear it around his neck. The paper had to be changed every twelve hours, and the medium received a dollar for each sheet. Although he was promised writing, or at least some zigzag lines, in three weeks at the utmost, at the end of six months 'not a zig nor a zag.' "Let spiritualistic reproaches of investigators, for lack of zeal and patience, be heaped up hereafter until 'ossa becomes a wart.' I care not: my withers are unwrung."

Dr. Furness next experimented with sealed letters. A question carefully sealed was sent to the medium, and the answer to the unopened letter returned. Many mediums were written to. They gave contradictory answers when asked the same question, and in every case the letter had been opened, and mucilage and skill been used to cover up the deception.

Dr. Furness's description of the materializing seances can only be appreciated when read in full. Everywhere he found fraud where he looked for honesty. The fraud is so gross, so easily made to leave its hiding-place and snatch the bait offered by an ingenious question, that it becomes ridiculous.

Professor Fullerton's account of the famous Zoellner investigations with Dr. Slade is a highly valuable contribution. He has personally examined Zoellner's confrères in the investigation, and finds that Zoellner was of unsound mind at the time; that Fechner was partially blind, and relied on Zoellner; that Scheibner was too myopic to see any thing, and was not quite satisfied with the seances; that Weber was old, and did not recognize the disabilities of his associates. On the evidence of these men,—deservedly honored in their own specialties, as they are,—without knowledge of the arts of a conjuror, has rested one of the most famous proofs of the truth of Spiritualism and its connection with the fourth dimension of space.

A device by which Dr. Knerr detected a fraud is too ingenious to be left unnoticed. He arranged a mirror about his person so that it reflected the hands of the medium at work on a slate under the table. He plainly saw the hand open the slate, read the question, and noiselessly write the answer, which the fair medium had the impudence to present to him the next minute as the work of departed spirits.

The mysteries and miracles that shape people's beliefs upon that which is most sacred to the human heart, thus resolve themselves, under the scrutiny of careful scientific observers, into a mass of vulgar frauds and low deceptions. The mystic theories and spiritual messages are 'disgusting cant'; the medium, a criminal.

The psychological process by which believers are convinced is the key to the secret of the success of Spiritualism: this is the problem that lies closest to the securing of that mental health with which such practices and beliefs are incompatible. If any one will recall the feelings of utter bewilderment on leaving for the first time a good performance of a professional trickster, and will imagine in addition that the things he holds dearest were at stake in the explanation of what he saw, he will easily understand the excited state of mind of a susceptible person on leaving a spiritualistic seance at which he has seen but not understood. If your friend is a believer, and urges your ignorance on to belief, you are apt to yield, and assume that credulous state of mind which accepts all and examines nothing. It is this state of mind that is to be prevented; it is this state of mind that is dangerous to mental sanity, that becomes morbidly hungry for something unusual, something mystic, something

occult. There can be no better check to the spread of this mental temperament (except, of course, a sound training in scientific reasoning) than such a report as this, of sincere, able, scholarly men, anxious to learn, and meeting only with practices for which the law provides the jail.

That these men have not yet exhausted the art of detecting deception is shown by the fact that they are confessedly unable to discover the methods by which a prestidigitateur performed slate-writing tricks in their presence: this needed more training than they as yet possess. But the magician confided his methods to one of the commission, and showed that they were simply tricks. This suggests the final point to be here noticed: this is, that the Spiritualists will have a roundabout way of explaining these frauds. They will say, "That does not prove that real manifestations do not exist." This the commission admit, but it makes it improbable in more ways than one. They claim that their explanations of how the things are done are rational from their point of view. They need the dark because darkness is negative; if the spirit takes on the peculiarities of the medium, that is a habit of the spirits; if the writing does not occur when the slate is looked at, it is because the magnetism of the eye is unfavorable; and so on, and so on. This is perfectly true. There is no proposition so absurd, no fancy so insane, as not to be capable of some kind of support, on the basis of some kind of a theory. But the logic upon which civilization is built is a marvellous network of mutually corroborating laws and observations, multiplying the probabilities of the truth of its conceptions in a geometrical ratio, and similarly dwindling into insignificance the possibility of theories opposed to its fundamental tenets. Of such a character are the explanations offered by the Spiritualists. They are not impossible in an extremely exact, ultimate sense. From a practical point of view, they are utterly impossible. But, after all, it is not the logic that convinces. It is because this system goes deeper, and appeals to the feelings, that it blinds its adherents to sense and reasoning.

The commission has done its work well, has set an excellent example in recording what they saw *accurately* (for all turns here, as in jugglers' tricks, upon the apparently most insignificant detail), in subjecting mediums to ingenious tests, in treating them courteously and sympathetically, as well as in exposing them plainly and mercilessly. The present report, though only a preliminary one, should do much to hasten that day, which Dr. Furness thinks not far distant, "when the more elevated class of Spiritualists will cast loose from all these physical manifestations, which, even if they be proved genuine, are but little removed from materialism; and eventually materializing seances, held on recurrent days and at fixed hours, will become unknown."

JOSEPH JASTROW.

NOTES AND NEWS.

THE New York Electrical Society has decided to give an electrical exhibition in this city during the coming fall in the large exhibition-building of the American Institute. The exhibition will open Sept. 28, and continue to Dec. 3, 1887, and is intended to include all that relates to the science and application of electricity in its broadest sense. No electrical exhibition has ever been held in New York, and it is confidently believed that the one now to be given will attract a large number of visitors, both residents and from other cities. The American Institute has provided ample means to carry out the designs of the society, which is also assured of the co-operation of the American Institute of Electrical Engineers.

— The *Political Science Quarterly* for June is a splendid number, the articles covering important topics in economics, history, and administrative science. Dr. Seligman's masterly article on the interstate commerce law, an abstract of which was read before the American Economic Association, is the leading article in the number. It is sufficient to say that the paper amply sustains Dr. Seligman's reputation as a master of the railway question in all its phases. Prof. Woodrow Wilson writes on the study of administration; and William M. Sims, chamberlain of New York City, discusses municipal government, making generous use of his knowledge of the details of the municipal machinery of the metropolis. Professor Burgess's paper on the Culturconflict in

Prussia — by the way, why is not the perfectly familiar *Cultur-kampf* used in the title, instead of a word which is partly foreign in form, and wholly so in sound? — is the first clear and adequate description in English of that very significant and important movement in Prussia's political history. The book-reviews are as numerous and as well done as usual. We observe that a very severe criticism is passed on the volume on New York in the 'American Commonwealth' series. Prof. Richmond Smith reviews Prof. H. C. Adams's 'Public Debts' in a very appreciative manner, describing the book as "careful, scholarly, and extremely suggestive." We observe this sentence, which Professor Smith uses in speaking of the industrial effects of public debts: "Professor Adams's discussion is acute and logical, and, in my opinion, a distinct advance upon the treatment of the same question by Leroy-Beaulieu, the distinguished French financier."

— Some remarkable facts as to the change in the population of Alsace-Lorraine are brought out by the recent publication of the results of the census taken in those provinces in December, 1885. The statistics are published in the *Landes Zeitung*, the official journal in the provinces. It appears that in December, 1885, the total population was only 1,564,355 as compared with 1,566,670 five years before, — a decrease of 2,315 in five years. Classified according to nationality, there were in December, 1885, 1,368,711 natives of Alsace-Lorraine, 151,755 Germans from other parts of the empire, and 43,829 foreigners; whereas in December, 1880, the natives of Alsace-Lorraine numbered 1,418,025, and the immigrants from Germany only 114,797. So in five years the native population has decreased by 49,254, while the immigrants have increased by 36,958. The increasing emigration of the native population explains their falling-off; and the *Landes Zeitung* estimates, that, if the present rate of diminution continues, the native population will have disappeared entirely in less than thirty years.

LETTERS TO THE EDITOR.

* * The attention of scientific men is called to the advantages of the correspondence columns of SCIENCE for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

The Total Solar Eclipse of 1886.

THE following brief account is penned in order that it may be published in time to be of service to the observers of the eclipse of 1887.

It was found that by using rapid gelatine plates an exposure of one or two seconds was sufficient to show the details of the inner corona satisfactorily with an ordinary telescope-lens. With a portrait-lens the ratio of whose aperture to its focus was as one to five, one or two seconds' exposure showed the outer corona satisfactorily, as far as a distinct falling-off place in the light. This was at a distance of from 15' to 30' from the limb of the moon. Beyond that the light was very decidedly fainter, and was shown best by exposures with lenses of the same ratio, of from eight to forty seconds. This light extended to from one to two degrees from the moon's limb, was very faint, and seemed analogous in character to the zodiacal light. It was clearly not a mere reflection of the corona in the camera-lenses, as it did not extend over the moon's image, where it would, in that case, have been brightest. Measurements of the actinic brightness of different portions of the corona were made, which will appear in a subsequent paper.

The corona showed the usual short rays of light proceeding from the sun's poles, and from the south-western quadrant a very conspicuous ray, appearing like a hollow cone projected to a distance of some twenty minutes of arc. On one of the long-exposure plates it was noticed that this was crowned by a curious fountain-like structure, — three fine jets, about a minute in diameter, shooting up 35' to 40' from the moon's limb, curving round, and falling back towards the sun. On closer inspection, seven other jets were counted, all more or less well marked, and all proceeding from the summits of bright rays of the corona. Some of these returned towards the sun, but the majority faded away at about 30' distance from the limb. Unfortunately, only one of the plates was taken on

a sufficiently large scale, and with sufficient exposure, to show this phenomenon, and the whole appearance may therefore be due to defects in the gelatine film of that plate. But, as the markings are certainly on the plate, I have ventured to describe them; the more readily, as a somewhat analogous appearance, though on a smaller scale, is represented in Mr. Ranyard's 'Observations made during Total Solar Eclipses' (Memoirs of the Royal Astronomical Society, xli., Plate x.)

Passing from the corona to the prominences, a number of them were seen near the equator, on both sides of the moon; but the most conspicuous one of all was situated in the north-western quadrant. It extended to a height of about one hundred thousand miles, and had apparently a somewhat spiral structure. The spectra of the various prominences were shown very clearly by the prismatic camera. In the equatorial ones the hydrogen and H and K lines were prominent, superposed on a background of continuous spectrum; but in the large prominence the hydrogen lines were all absent, confirming Professor Tacchini's observation of its invisibility both before and after totality.

The H and K lines, however, were strongly marked; and it seems quite probable that numbers of prominences may escape ordinary observation by the spectroscopic method, merely because they shine only by the actinic radiations, and are hence invisible to the eye. The remedy for this difficulty would be, either to use a fluorescent eyepiece, or, better, to photograph them, instead of trusting merely to eye-observations. The position of the maximum density in the continuous spectrum of the prominences was found to be quite different from that of the corona. In the prominences and in the sun it is found to be not far from the G line, while in the corona it lies between G and F. This may indicate, that, besides the gaseous constituent, the corona is composed also of incandescent solid or liquid matter, which, while cooler than the sun, still shines by its own light. In this case, the position of the maximum might give us a hint as to the temperature of the corona.

Photometric measurements of the general light during totality were made, which, roughly stated, indicate a brightness equal to one candle at about 29 inches or 73.5 centimetres distance. Previous observations by Mr. W. O. Ross in 1870 had given 18.5 inches; and by Dr. J. C. Smith in 1878, 51.25 inches. It had been intended to make some observations on the actinic power of the sky during the eclipse, but unfortunately the plates reserved for this purpose were found to have been spoiled by the excessive moisture of the Grenada climate; so that no result was obtained. In some of the longer exposures, however, where a large field was used, portions of the landscape appeared upon the plates, showing that considerable actinic radiation was given out even during the total phase.

A large number of persons observed the shadow-bands, which appeared before and after totality. The general result of their observations indicated that the bands were about five inches wide and eight inches apart, that they were colored like the spectrum, and that they moved with a velocity comparable with that of an express-train; at all events, much faster than a man could run. Before totality the bands lay N. 12° W. and S. 12° E., and travelled west: after totality they lay N. 60° E. and S. 60° W., and travelled north-west. The wind during totality blew from the point S. 35° E.: during the partial phases it was blowing from six to nine miles an hour, but fell during the three minutes of totality to between two and four miles. The thermometer ceased rising as totality approached, but afterwards rose more rapidly. The extent of the effect produced on it amounted to .4° C. This figure may seem small, but it must be remembered that the fluctuation between sunrise and noon in these tropical islands in the summer season seldom exceeds two or three degrees.

In general results, the expedition may be said to have proved successful, although one of the most important instruments, the forty-foot photo-heliograph, failed to work, through lack of sunlight previous to totality, which prevented the application of the necessary adjustments to the mirror. It is hoped, however, that this omission will be in part rectified at the present eclipse, as a similar instrument, even better equipped, has been sent in charge of Professor Todd to Japan; and, if the weather favors, some excellent pictures should be the result.

W. H. PICKERING.

Harvard Observatory, Cambridge, June 23.

Women.

A LATE correspondent of yours is guilty of a species of bad taste, which happily is rapidly becoming extinct. It was once considered both clever and gentlemanly to speak of women as if they belonged to one of the lower orders of animals, but that period has now quite passed by. Remarks of such a kind are hardly ever met with in English publications, and seldom in those of this country within a certain range of longitude. I happened to see it stated lately in a book on etiquette that it was no longer considered good form to make insulting remarks about women, and, when a principle has reached that organ of distribution, it may be considered that it has already become pretty widely disseminated. The change is an agreeable one, not only to women, but also to the rather numerous class of chivalrous-minded men.

If women are not capable of a very high degree of intelligence, it can at least be maintained that they are capable of a higher degree than Americans. An English woman has written greater novels, and a Russian woman has made more important contributions to pure mathematics, than any American man. Neither women nor Americans have had very great incentives to intellectual work hitherto, but it is quite possible to hope that they will both play a more important rôle in the future than they have done in the past.

If women are more easily frightened than men, it is as easy to attribute it to a more sensitive organization as to any other cause. Poets and musicians are not as cool and collected in the presence of danger as firemen, nor white men as the American Indians. Many people consider that the delicately balanced nervous organization of the horse indicates as high a degree of development as is to be found in more phlegmatic and thick-skinned varieties of animals.

It is not surprising to find that your correspondent's bad taste is equalled by his bad logic. It is seldom that one finds in so short a space so many pretty specimens of unreason:—

1. The cockroach, when caught between two hot portions of metal, chose to jump down instead of walking over them. If it had broken its neck, and if the metal had not been so hot as to injure it, this conduct would have turned out to be very foolish; but, in fact, the cockroach ran away unhurt. The highest wisdom could not have dictated a more prudent course of conduct, and there is hence no analogy to a case of jumping from a window in unreasoned terror when there are other and better modes of escape.

2. Because an organized being has reached a stage of development where reasonable conduct may be looked for, it does not follow that none of its actions will be instinctive. Both men and women perform many instinctive actions,—a drowning man will instinctively catch at straws,—but that does not prove that they are not endowed with reason in addition to instinct.

3. Your correspondent maintains that what would be instinct in women, and hence proof of a low grade of intelligence, is, in the cockroach, “singularly like the operation of reason.” But it is no mark of reason having come into play, that conduct looks intelligent to the outsider. If it were, we should have to attribute reason to the *Amœba*, which encloses food and not grains of sand, and to the *Drosera*, which shuts up on bits of meat and not on bits of chalk. The one sure objective test of the action of reason is that different individuals behave differently under the same circumstances, and that test is wanting here. We are expressly told that every one of more than a dozen cockroaches did exactly the same thing. Cockroaches make their constant home by the kitchen range, and there is hardly any source of danger which ancestral experience is more likely to have warned them of than hot metal.

L.

Ancient Scrapers.

A FACT has lately come to my knowledge which may be of interest to archæological students of the ancient stone age, who have frequently expressed surprise that so few of the ancient scrapers, blades, chipped axes, and other cutting implements, show signs of use.

Lieutenant Stoney, Lieutenant Ray, Nelson, Turner, and others

have sent to the National Museum a large number of modern Eskimo scrapers, and also many specimens of the implements used in chipping and sharpening their scrapers. The latter are of two kinds: 1. A curved handle of walrus ivory, with short pieces of antler lashed in a groove cut in the front of the handle (this form has frequently been figured); 2. A single cylindrical handle of wood, into one end of which an incisor tooth of a beaver has been firmly fixed. Indeed, one or two specimens consist of a portion of the upper jaw with the teeth in place. This tool is called by all collectors a knife-sharpener. Lieutenant Stoney informs me that during his late exploration in Kotzchue Sound he saw the natives using these implements, and says that they keep them always at hand, and spend much time in touching up the edges of these scrapers and other stone cutting-tools, and that the beaver-tooth sharpener is also employed by the ivory-carvers to keep a fresh edge on their metal knives. The variation in the length of scraper-blades is due partly to the fact that some of them, when new, are over two inches long, and become worn down by constant sharpening until they are reduced to a mere stub. It will be seen from Lieutenant Stoney's observation that it will be difficult to find in Alaska a scraper-blade showing signs of use, the interest of the artisan depending upon his keeping his edge constantly sharp.

O. T. MASON.

Washington, June 25.

Volapük.

I COPY the titlepage of one and a part of another grammar of Volapük, before me. Hachette & Co. is a London house, as you will see. The Paris house is Le Soudier. “Grammar of Volapük: The Language of the World. For all Speakers of the English Language. Translated and published with the consent of the inventor, Johann Martin Schleyer, by W. A. Seret. Glasgow, Thomas Murray & Sons; London, Whittaker & Co.” “International Commercial Language. Abridged Grammar. . . . By Karl Dornbusch. London, Hachette & Co.; Paris, H. Le Soudier.”

E. A. HORSFORD.

Cambridge, June 25.

Pineal Eye of Lizard.

THE pineal eye is so well developed in the common pine-tree lizard (*Sceloporus undulatus*) that it may probably seem to warn its owner of the advent of daylight. It is a lenticular, glassy area of the skin of the vertex (about a millimetre in sagittal diameter), surrounded by a yellow border, and having a dark spot in its centre. The dark spot is opaque, caused by a mass of pigment internal to the dermis, set on the extremity of a pineal outgrowth from the brain. The clear area around it is caused by the dermis, which is transparent and free from the pigment which covers it internally in other parts. The eye is covered by an escutcheon-shaped epidermal shield, more transparent in the centre and larger (3×3 millimetres) than the normal epidermal scales. The only sign of degeneracy is the central cloudy mass of pigment, like a big cataract.

G. MACLOSKIE.

Princeton, June 25.

The Charleston Earthquake.

I FEEL thankful to Professor Mendenhall for his forcible criticism of the paper relating to the Charleston earthquake, and fully concur with him in his remarks concerning the uncertainty of the data upon which the inoseisms were drawn. This was commented upon in similar vein in the paper under discussion. He cannot complain of them more loudly than we did. The features to which he calls attention (viz., that the curves of high intensity are less sinuous than those of low intensity) had not escaped our attention, and the results of our reflections were these: 1st, The data indicated that the amount of variation of intensity within any zone or annulus generally bears a smaller ratio to the mean intensity of that zone when the mean intensity is high than when it is low (I think this was to be expected, and is intelligible from the nature of the case), hence there ought to be less sinuosity in the inner than in the outer curves; 2d, In order that the amount of sinuosity may be in due proportion in all curves, the density of observation (i.e., number of observations per unit area) should be inversely pro-

portional to the square of the distance from the origin. Perhaps it is needless to say that the observations had no such distribution. But, after all is said, it must be admitted that there is much justice in Professor Mendenhall's criticism of the isoseismals, and he certainly scores an important point. An earnest and conscientious effort will be made to remedy the defect he has undoubtedly proven.

As regards the 'areas of comparative silence,' I think they have been too well established by the data in hand to be explained away on the ground of defective testimony. They attracted attention at an early stage of the investigation, and were at first thought to be due to defective testimony; but as the information increased, it was seen that they were not so easily disposed of. Special inquiry was then made, and the result was, to our thinking, a full confirmation of their reality.

In his criticism upon the method of computing the depth of the focus, he proposes an argument which we anticipated would be raised against it. He says, "As far as can be seen from the contents of the paper, the result depends upon the unjustifiable assumption that surface destruction is proportional to" the energy per unit area of wave-front. I cannot admit that the paper implies that assumption. But if he will permit me to substitute the word 'effects' for the word 'destruction,' then I will say that the result does depend upon the assumption so modified, and stands or falls with it. And, moreover, I hold that assumption to be not only justifiable, but next door to an axiom. If our estimate of relative intensities were to be derived solely from the destruction of buildings and chimneys by a force which in turn must be measured by the maximum acceleration of the earth-particle in a horizontal plane, our argument would indeed be in a pitiable plight. But we ought not to be, and certainly are not, so limited. Other means of forming an approximate estimate of relative intensity are abundant, even where the destruction is little or nothing. Subject to local modifications, a great earthquake is bound to make itself felt somehow, and in due proportion to its energy, whichever component, vertical or horizontal, predominates. In the epicentral tract, brick buildings were few; but there were plenty of wooden ones, and plenty of intelligent men to tell what had happened. The best but by no means the only inanimate testimony was furnished by the railroads which cross this tract. They were like continuous lines of seismometers; and the men who repaired them had no difficulty in stating where the road-beds were shaken up most, and where least, and how the effects varied from mile to mile.

What Professor Mendenhall really challenges, I infer to be, not the theory, but the competency of the data through which the theory must be applied, if it can be applied. He appears to doubt the possibility of procuring such data; but it seems to me that he overestimates the exactions. He sees, indeed, that the vanishing of the constant α dispenses with the necessity of making any absolute evaluation of a single intensity, or even of the successive ratios between intensities. All that we require is to find, if possible, where these intensities vary most rapidly along a line. It is analogous to trying to locate, without the use of a level, the steepest point of a hill whose profile is similar to our intensity curves. It cannot be done exactly, but it can be done within moderate limits of error; and I have not much doubt, that, when Professor Mendenhall sees the data, he will concede as much. It was distinctly stated in the paper that the method was believed to be incapable alike of great precision and of great errors.

But, though I cannot yield to his criticism on this point, I am still greatly indebted to him for it. It is instructive in pointing out sharply what treatment must be given to the data to enable readers and investigators to judge of the validity of the method, and how the facts must be marshalled.

He also dissents from our inference that there were some facts in Charleston which seemed hard to explain upon the assumption of amplitudes of the earth-particle less than ten inches to a foot. This was suggested as a maximum confined to a few spots, while the mean amplitude was presumed to be considerably less. Let us examine this point.

In all great earthquakes, those who have felt their violence near the epicentrum have been impressed with, and testified to, an apparently large amount of movement in the soil,—an amount to be measured, so far as they could estimate, not by millimetres, but by

inches, and sometimes even by feet. To verify these purely sensory estimates was, of course, impossible; but the circumstantial character of the testimony seemed, in the absence of precise measurement, to warrant the belief that the movements probably had about that order of magnitude. When the seismograph was applied in Japan to the measurement of the frequent but moderate shocks, and it was found that an amplitude of a few millimetres would sometimes crack walls and throw down chimneys, it was at once inferred that the unmeasured estimates or guesses of the amplitude in the grander shocks had been greatly exaggerated: for, the energy being proportional to the square of the amplitude, it seemed needful to multiply those already measured only a few times to obtain a destructiveness commensurate with that exhibited in the worst catastrophes. There has been, therefore, a great change of opinion about these large estimates among seismologists; but I think it can be shown that such estimates are not necessarily invalidated by the seismograph.

The intensity of a shock is not alone proportional to the square of the amplitude, but also to the wave-velocity divided by the wave-length. It is, I believe, a general fact that great amplitudes of earthquake-waves are accompanied with great wave-lengths. This does not follow from the accepted laws of wave-motion in elastic solids, but is an independent fact, whose explanation must go back to the nature of the originating impulses. Thus increasing amplitude does not carry with it an increasing destructiveness in so rapid a ratio as might at first be supposed. The displacement is greater, but the time of displacement is longer. Again, the amplitude diminishes as the wave moves on; at least as fast as, and probably faster than, the distance from the origin increases. Let us, then, endeavor to make a comparison, rough though it must necessarily be, between the larger amplitudes measured by the seismograph, and those which may be inferred in localities shaken by the Charleston earthquake with equal energy. I regard it as improbable that the intensity of the most vigorous shocks measured by the seismograph in Japan (so far as published) exceeded that at Atlanta, Asheville, and Raleigh, all of which have been estimated to exceed No. 7 in the Rossi Forel scale. If we take ten millimetres as the average amplitude of those places, we shall not exceed the higher ones recorded by the seismograph for shocks of probably not greater intensity. The mean distance of these places from the centrum is eleven and a half times as great as that of Charleston. This would give an amplitude of about three inches at the latter place, on the assumption that the wave-lengths were equal to the Japanese, and that no energy was dissipated as the waves moved on. The last assumption is certainly untrue, and, whatever allowance may be made for it, must lead to a greater inferred amplitude at Charleston. It does not seem to me that a mean amplitude for the greater waves in that city, of three to four inches, is too much, while local maxima may have been considerably greater. The seismograph has not as yet tackled a first-class earthquake in the vicinity of the central tract.

Although I am still disposed to adhere, either wholly or in part, to most of the propositions advanced in the paper referred to, I must still acknowledge the high value of Professor Mendenhall's criticism. It defines much more sharply the issues involved, and is full of most useful suggestion.

C. E. DUTTON.

Washington, June 23.

Cyanhydric Gas as an Insecticide.

AMONG the insect-enemies to plant-life, of which California has received and is still receiving a full assortment from all parts of the globe, the most formidable is the *Icerya purchasi*, a coccid which, instead of the hard shield that protects most of its congeners the scale-lice, surrounds its egg-masses with a woolly fur that in many respects serves even as a more efficacious protection. It has until recently been supposed to have come from Australia; but, according to late researches of Professor Riley, it is to the Island of Martinique that we are indebted for this most pernicious insect. It there infests the sugar-cane, and may readily have come in with the canes often placed for drainage within the hogsheads of raw sugar. Being apparently omnivorous, it has not been dismayed by the absence or scarcity of its original plant-food. Pine and cypress appear to be nearly as much to its taste as the

pungent *Eucalyptus* and the highly tannic acacias, the black locust, and all kinds of fruit-trees and shrubs, including the *Citrus* tribe: when hard-pushed, it will even be content with grass and weeds for a while. Being enormously prolific, and thus far apparently free from any effective enemy but man, its spread is very rapid, and its attack most formidable and quickly fatal, even to large trees. It is very tenacious of life in all its stages of development. Its eggs, stowed away in thick masses of white wool, are very difficult to kill, as most insecticide-washes will rebound harmlessly by capillary repulsion.

The most fatal work of the *Icerya* has been done in the orange-groves of Southern California, where even the most persistent fight against it, with every variety of insecticide-washes, has only partially checked its ravages, and has nowhere succeeded in extirpating it entirely from an orchard, in consequence of the difficulty of reaching effectively both surfaces of every leaf in the dense-topped evergreen-trees. Even when the foliage, and therefore at least one crop of fruit, has been sacrificed by the use of caustic alkaline washes, success has not been complete.

The use of gaseous insecticides within a gas-tight tent lowered over the trees, has long been suggested against this, as well as other insects infesting evergreen-trees; but experiments made, e.g., with vaporized carbon bisulphide, have not given satisfactory results in practice. Either the insects were not completely destroyed, or the foliage was seriously harmed when the treatment was long continued.

The repression of the *Icerya* having at last become a life-and-death question for some of the older citrus-orchards, it was determined by some orchardists in the neighborhood of San Gabriel to have the feasibility of gaseous insecticides thoroughly tested. At their request, Mr. F. W. Morse, assistant in charge of the agricultural laboratory at the University of California, was detailed for this purpose; and the experiments made by him during nearly two months have furnished some scientifically interesting results, while demonstrating that cyanhydric gas can be made fully effective without harm to the foliage, and that seven other gases tried were either too slow in their action on the insect, or caused severe injury to the foliage. These other gases were chlorine, sulphuretted hydrogen, ammonia, carbon monoxide, oxalic and formic acids, and carbolic acid. A summary statement of these experiments is given in Bulletin No. 71 of the California Experiment-Station, just published.

Several interesting facts are thus brought out. One is, that apparently no practically adequate insecticide effects are produced when these effects depend upon the respiration of the gas by the insect; the respiratory action being so very slow, as compared with that of the higher animals, that anæsthetic rather than toxic effects are produced within the practically admissible limits of time: while within these limits the foliage also suffers, as a rule.

Cyanhydric gas, acting directly upon the nervous system through the nerve-ends, is quickly fatal, independently of respiration, and even in very small amounts. It is slow in affecting the insects' eggs inside of their woolly casings; but an effective insecticide dose also acts very injuriously on the leaves of the trees.

To prevent the latter effect, intermixture with some other gas beside air suggested itself. Experiments with sulphuretted hydrogen gave unfavorable results. This gas seemed to mitigate only the action on the insects (by anæsthesia). Complete success was, however, attained by the use of carbonic gas, evolved from sodic bicarbonate at the same time that the cyanhydric gas was evolved from potassic cyanide. The insects were killed as promptly as when air alone was present, but even a lengthy application did not affect the foliage in the least. The minimum proportion of the bicarbonate required for full protection was, for the case of a tree having a top twelve feet in diameter covered by an air-tight tent, a pound and a half, ten ounces of the cyanide being used at the same time.

It is not easy to conceive the exact cause of the protective action of the carbonic-dioxide gas upon the leaves; but there can be no question as to the fact, and it is hoped that further investigation will throw light upon the problem. The board of supervisors of Los Angeles County having requested a further elaboration of the details of the process by Mr. Morse, the latter will have full opportunity for testing the conditions and limits of the action of both gases, and upon deciduous as well as citrus trees. The high value

of the latter renders the process perfectly available for them, even if, on account of the later hatching of unscathed eggs, the operation should have to be repeated. Whether the same will hold good of other orchard-trees, and whether their leaves will experience the same adequate protection from the presence of carbonic gas, remain to be seen.

E. W. HILGARD.

University of California, June 13.

University of New Zealand.

I HAVE just received your issue for June 3, with the 'New Zealand Letter' therein, dated Dunedin, April 20. As the agent in London of the University of New Zealand, permit me to supplement the exceedingly inadequate account of that body given by your correspondent. He states correctly that the university, like its prototype in London, does not teach; but he only hints at powers to confer degrees, and says not a word about any examinations. As a matter of fact, so anxious is its senate to make its degrees worth having, that the whole of its degree-examinations are conducted by English examiners, who are instructed that their standard of examination is to be at least as high as that of the University of London, for corresponding degrees. At the present moment I am seeing through the press no fewer than eighty-six degree-examination papers, set by fourteen examiners, all men of the highest standing, and present or past examiners in either Oxford, Cambridge, or London Universities. These papers will be worked in New Zealand in November, and the answers transmitted to me. After their revision by the examiners, a meeting of these gentlemen will be held in London, and the results will be transmitted to Wellington by cable. This has been going regularly on for more than seven years, and there are now nearly one hundred candidates for degrees every year of both sexes. This, from a total population of not exceeding half a million, speaks well for the colony. The degrees conferred as yet are in arts, laws, and science, but provision is made for degrees in medicine and in music.

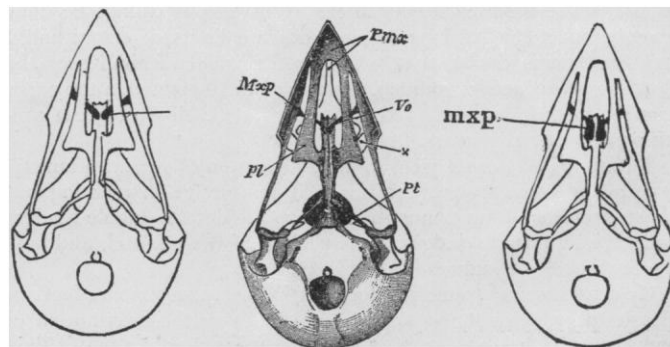
The examinations are, I believe, held in different towns in the colony simultaneously. The 'peripatetic annual session' of which your correspondent speaks, is simply the annual meeting of the university senate. Its members are scattered over a very large area (travelling-facilities are not great), and hence the senate usually does all its work for the year at one sitting, which lasts for several days.

WM. LANT CARPENTER.

London, June 13.

The Maxillo-Palatines of *Tachycineta*.

IF Dr. Shufeldt will consult my note in *Science* for May 13, he will find that neither the accuracy of his figure, nor the entirety of the specimen from which it was drawn, is there called in question. It is evident, to one acquainted with the palatal region as it is found in the swallows, that Dr. Shufeldt's figure represents a skull with mutilated or abnormal maxillo-palatines, in either case not perfect.



Since Dr. Shufeldt says his specimen is not broken, it must be abnormal. The extent and importance of the alterations Dr. Shufeldt charges me with having made in hastily tracing this figure, can best be understood by comparing the tracing (Fig. 1) with a reproduction of the original (Fig. 2). Fig. 3 shows the maxillo-palatines approximately correct.

FREDERIC A. LUCAS.

Washington, D.C., June 15.